

W. Cork,

Armstrong's
VIBRACORK
for lessening transmission of vibration

ARMSTRONG CORK COMPANY • LANCASTER, PA.

HOW TO LESSEN VIBRATION

VIBRATION ANNOYING AND DESTRUCTIVE

Vibration caused by rotating or reciprocating machinery is more than just unpleasant. It is often actually destructive to buildings. The noise which accompanies it lessens efficiency and in all cases constitutes a nuisance.

Armstrong's Vibracork provides an economical and thoroughly practical means of guarding against vibration. It prevents lowered efficiency, hastened depreciation, irritating noises, and the other natural results of vibration.

Vibration from motors and engines, fans, blowers, pumps, printing presses, mixers, generators, elevator machinery, and similar equipment can be quieted with a cushion of Vibracork. Even

whole floors of buildings can be effectively isolated. Smaller equipment, too, such as oil burners and electric household refrigerators, can be hushed economically with Vibracork.

How Vibracork Is Made

Vibracork is a resilient board made of pure granules of cork, compressed and baked under pressure. A selected grade of cork is used. The granule size is held within definitely prescribed limits, and accurate weighing devices insure exact control of the density of the material. The boards are strong and durable, and maintain their physical characteristics indefinitely when properly used.

Armstrong's Vibracork is supplied in boards twelve inches wide and thirty-six inches long, in

thicknesses from one to six inches. Other dimensions, less than twelve inches by thirty-six inches, can be cut to order. Standard thicknesses are 1", 1½", 2", 3", and 4". Most

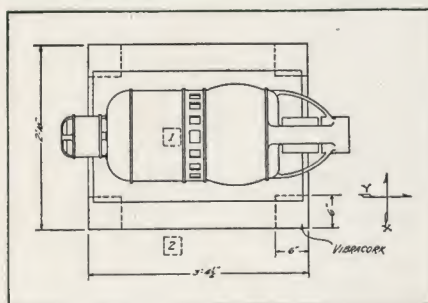


Fig. 1.

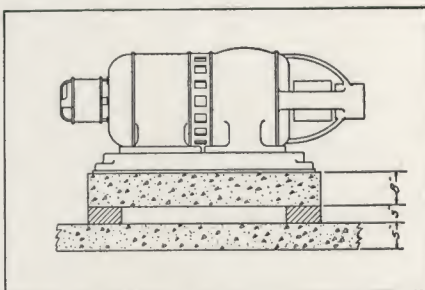


Fig. 2.

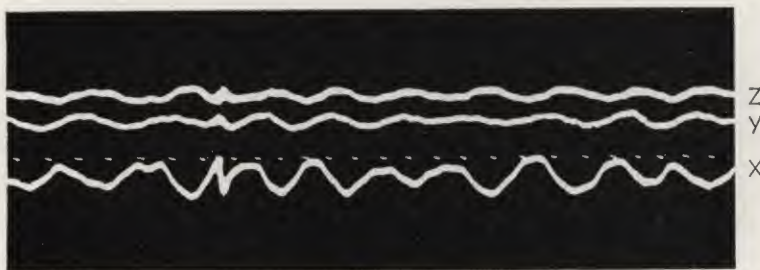


Fig. 3. Z shows vertical vibration. Y shows horizontal vibration parallel to the shaft. X shows horizontal vibration at 90° to the shaft. The timing dots are 1/2000 of a minute apart.

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Fig. 4. Z shows vertical vibration. Y shows horizontal vibration parallel to the shaft. X shows horizontal vibration at 90° to the shaft. The timing dots are 1/2000 of a minute apart.

MOTOR GENERATOR SET VIBRATION RECORD

Fig. 1. Plan view showing the location of the Vibracork.

Fig. 2. Section through foundation block and floor slab.

Fig. 3. Vibration record at Point 1, Fig. 1, showing vibration in the motor generator set.

Fig. 4. Vibration record at Point 2, Fig. 1, showing completely reduced vibration in the floor slab.

WITH ARMSTRONG'S VIBRACORK

applications are made with the thinner boards, that is, the 1", 1½", and 2" thicknesses.

Made in Several Densities

Armstrong's Vibracork is made in three densities. This close control is possible because Vibracork is a manufactured product, whose density can be controlled and held uniform—unlike natural products whose densities vary widely. Vibracork's three densities are designated as follows: XL, Standard, and Heavy. Their wide range insures that a material with required characteristics is available to accommodate all of the machinery isolation problems encountered in ordinary practice.

The characteristic resilience of Armstrong's Vibracork is unique even among resilient materials.

The thousands of minute air cells, which are part of the structure of cork, form a cushion which never loses its "life." Unlike other materials, Vibracork never hardens or "sets," if

loaded within its proper limits. Even after years of service, its efficiency in absorbing sound and vibration remains undiminished. For example, Vibracork installed in 1904 to isolate fans and blowers in the Bellevue-Stratford Hotel, Philadelphia, still is serving efficiently. Vibracork may be relied upon to serve the purpose for which it is intended as long as the machine is in operation, provided it has been properly used. It is not affected by atmospheric moisture, and is not subject to rot and decay. If applied properly, it will not disintegrate or change its physical characteristics in any manner.

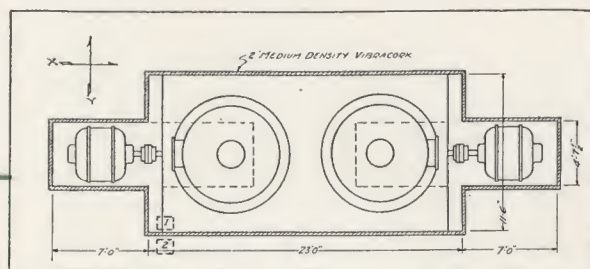


Fig. 1.

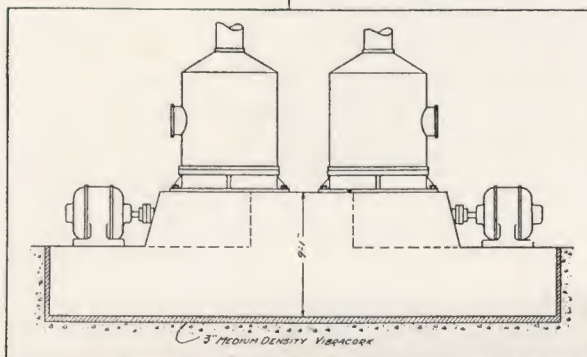


Fig. 2.

VIBRATION RECORD OF COAL PULVERIZERS

Fig. 1. Plan of foundation of pulverizers.

Fig. 2. Section of foundation of pulverizers.

Fig. 3. Vibration picture taken at Point 1, Fig. 1, showing the vibration in the foundation.

Fig. 4. Vibration picture taken at Point 2, Fig. 1, showing the great reduction in the vibration as it passes through the Vibracork.

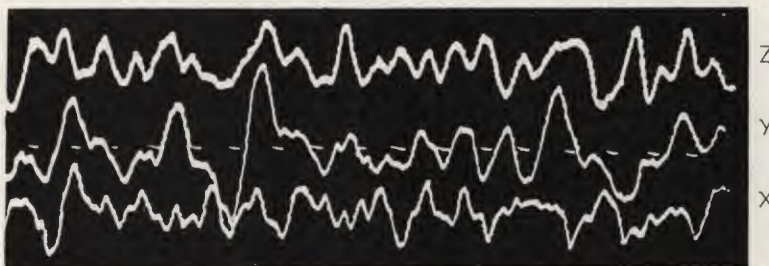
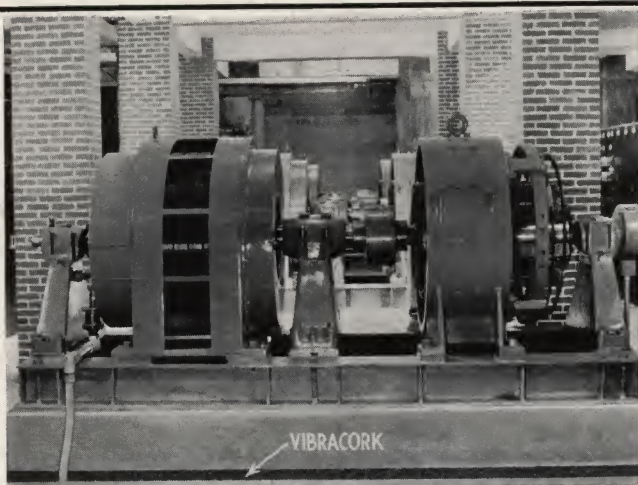


Fig. 3. Z indicates the vertical vibration. Y indicates the horizontal vibration at 90° to the drive shaft. X indicates the horizontal vibration parallel to the drive shaft. The timing dots are 1/2000 of a minute apart.

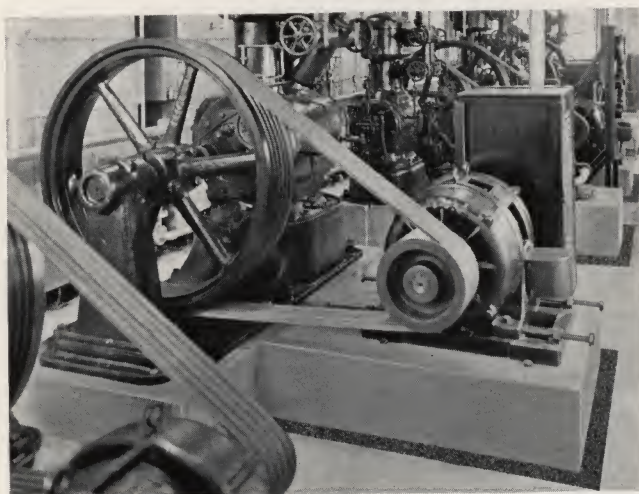


Fig. 4. Z indicates the vertical vibration. Y indicates the horizontal vibration at 90° to the drive shaft. X indicates the horizontal vibration parallel to the drive shaft.

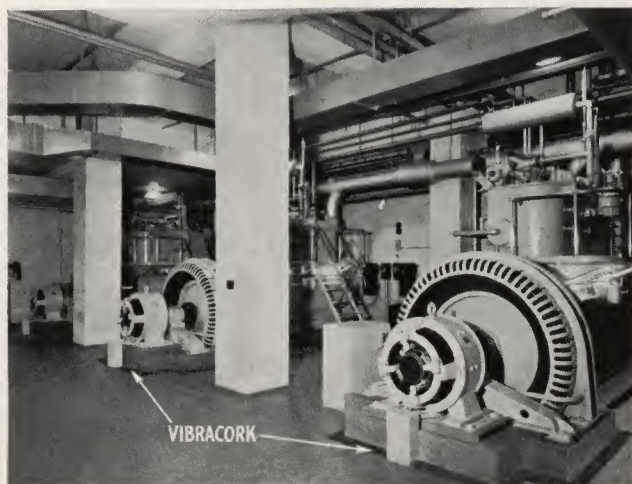
HOW TO LESSEN VIBRATION



Armstrong's Vibracork, used to line the motor generator pit in the new Supreme Court Building, in Washington, D. C., insures elimination of nuisance caused by vibration.



Foundations for all machinery in this room which is located above the roof of Sattlers Department Store in Buffalo, N. Y., are isolated with Armstrong's Vibracork.



Engine room noise is hushed at the plant of the Dallas Gas Company, Dallas, Tex. Pits were lined with Armstrong's Vibracork before the concrete foundation was poured.

INSTALLATION CARE NEEDED

Many types of materials have been used for isolation purposes. Often an analysis of various materials will show that some one good quality is outweighed by many undesirable characteristics. Armstrong's Vibracork combines in one product all the essential qualities necessary for efficient isolation of moving machinery. To secure the desired result it is essential in installing Vibracork to keep the following points in mind:

1. Avoid through-metal, such as through-foundation bolts, direct contact with metal base and concrete, etc.
2. Through-bolts, if unavoidable, should be properly isolated.
3. The area of Vibracork used should be so designed as to give a deflection in the Vibracork which will enable it to serve best as a spring in the damping of vibration.
4. Where possible, a heavy foundation should be provided, as the foundation aids in the damping by lowering the center of gravity of the installed machine, giving additional mass to the equipment and assuring better compression (spring) conditions in the Vibracork.

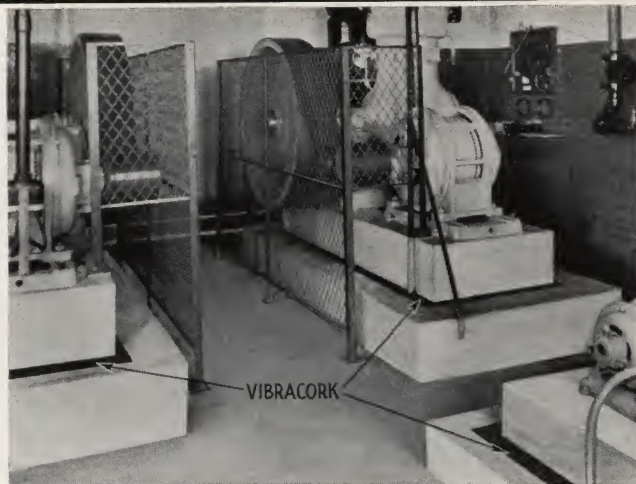
WITH ARMSTRONG'S VIBRACORK

Adaptable to Any Service

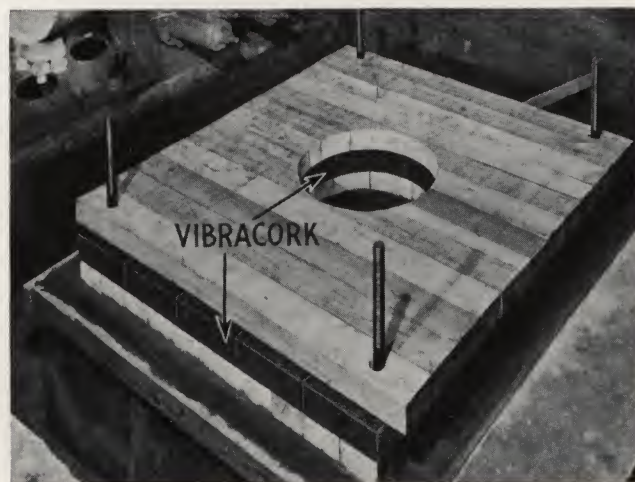
The uniformity of Armstrong's Vibracork, and the wide range of thicknesses and densities in which it is available, allow for the scientific adaptation of the material to any service. While the study of sound and vibration isolation is a complex problem, for all practical purposes it can be reduced to a fairly simple character. The basis of all calculations is the fact that, in order to secure satisfactory results, machinery isolation material must be under a certain amount of compression, yet not so much that resiliency is destroyed.

Securing Sufficient Compression

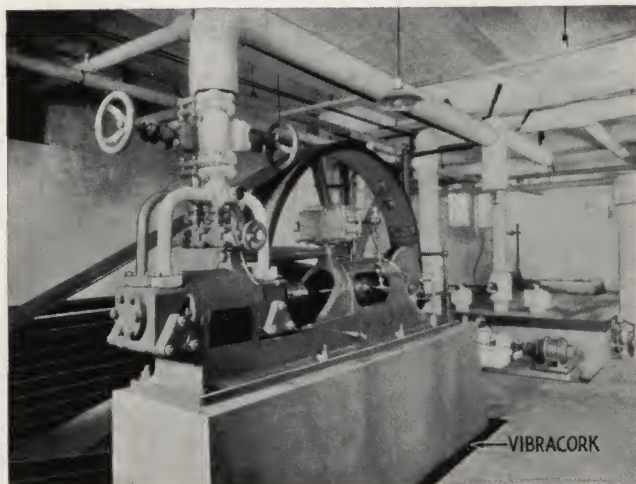
In the case of many machines, loads heavy enough to secure a satisfactory compression cannot be obtained if the isolation is applied over the entire base of the machine. In other words, to secure adequate compression, it is often necessary to apply isolation only on limited areas. This is sometimes done by placing pads under the corners of the machine. But a much more satisfactory method is that shown in Figures 3 and 4 on page 9, in which a long, narrow strip of isolation is inserted between channel-irons supporting the base of the machine. The advantages of this latter method are obvious, since it provides an even distribution of the load, and eliminates the possibility of the machine's working itself out of line.



Compressor bases and pump foundations on the sixth floor of the Davison-Paxon Company Department Store, at Atlanta, Ga., are isolated with Armstrong's Vibracork.



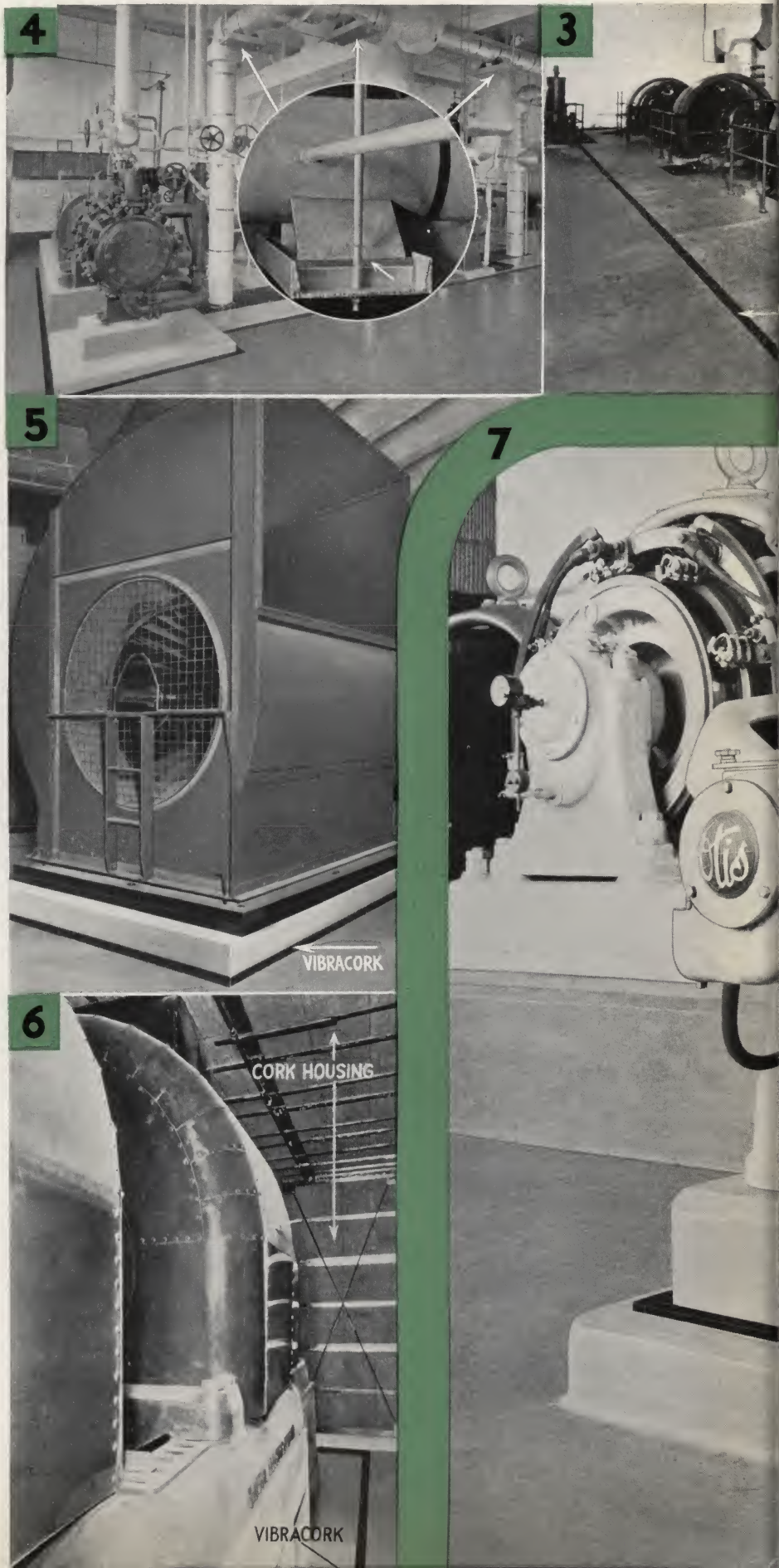
A foundation for a mold jarring machine at the plant of the National Alloy Steel Company, Blawnox, Pa., is shown above. Vibracork has solved the noise problem.



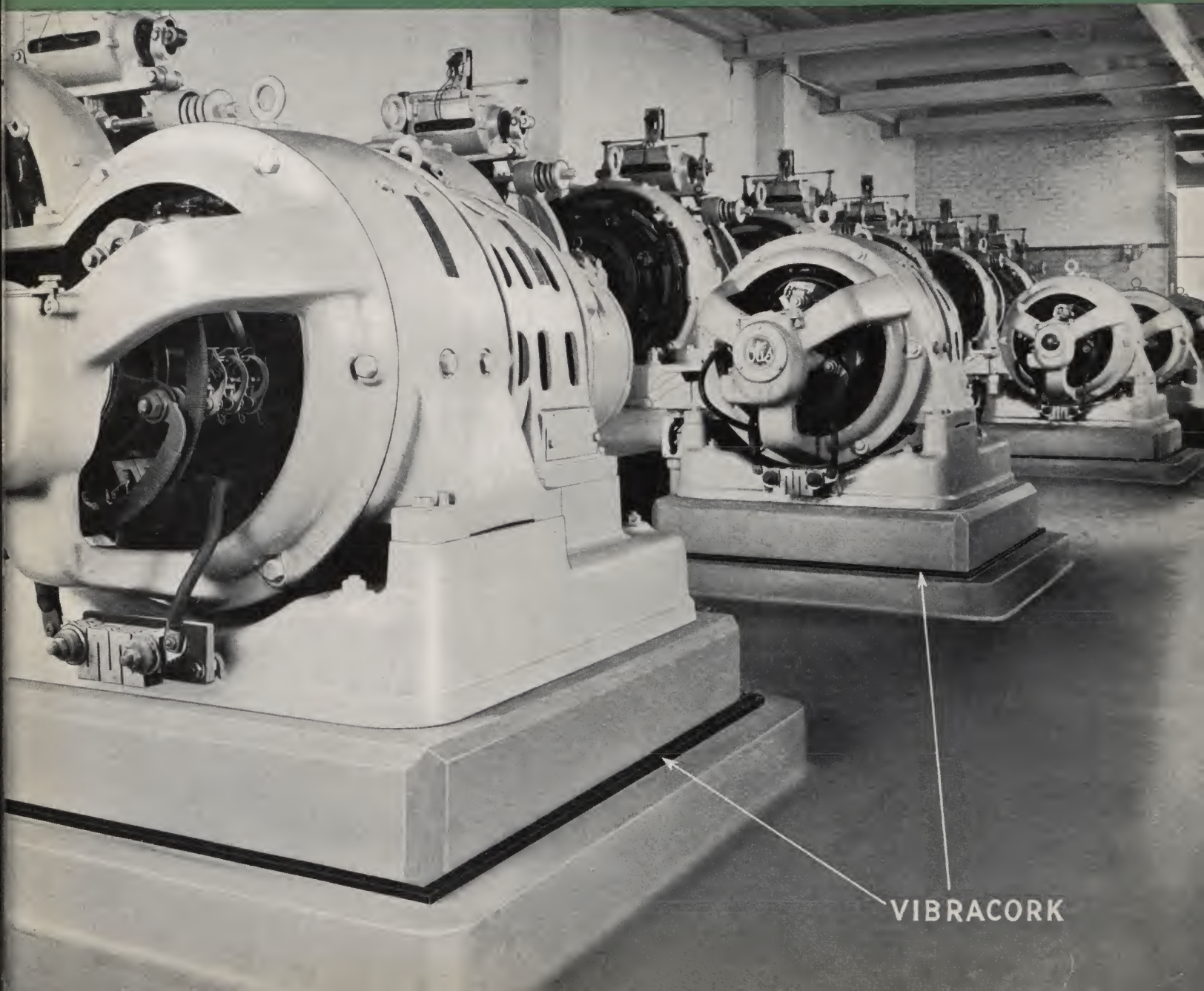
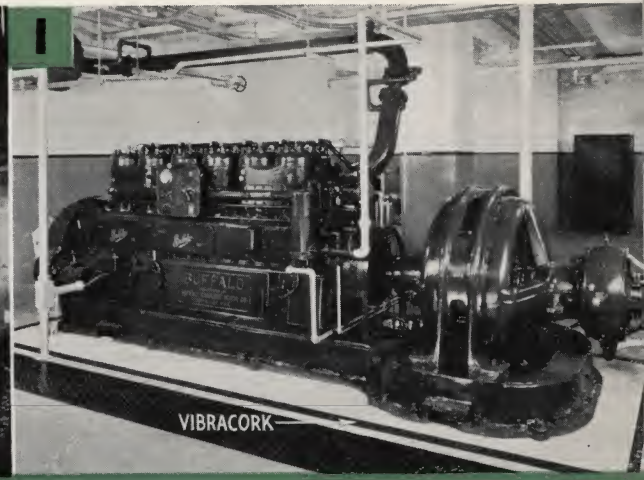
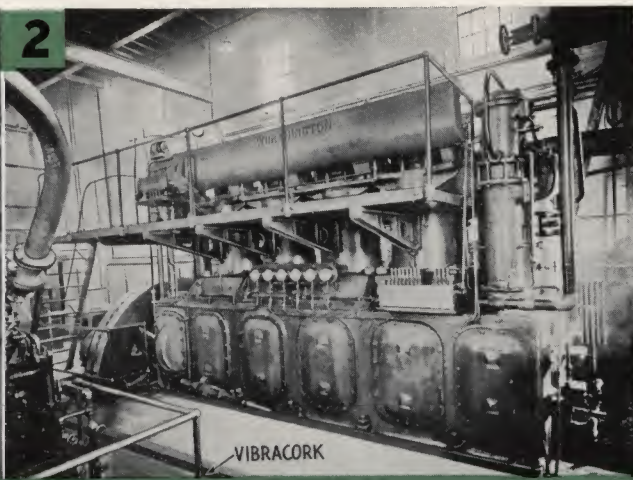
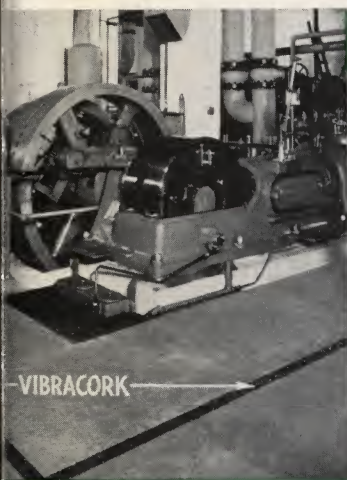
Vibracork helps provide a quiet atmosphere for patients in the Charlotte Hungerford Hospital, Torrington, Conn. Ice machine foundations rest on resilient cork cushions.

HOW TO LESSEN VIBRATION

1. Sides and bottom of the foundation block for a Buffalo Gasoline Engine in the Bell Telephone Building, at Dayton, Ohio, are isolated with Vibracork to reduce transmission of vibration. Vibracork prevents lowered efficiency, hastened depreciation, irritating noises, and the other natural results of vibration.
2. Quiet engine operation is insured by Vibracork at the plant of the Casco Bay Light & Power Company, Portland Harbor, Maine. The cork isolates the engine from a ledge of rock on which the foundation rests. Since Vibracork is a manufactured product, its density can be closely controlled and held uniform.
3. Transmission of vibration from the engine room at the Hamm Building, St. Paul, Minn., is prevented by a cushion of resilient Vibracork. This material is made in a range of densities, insuring that a material with the required characteristics is available to accommodate all of the isolation problems encountered.
4. Vibracork completely isolates the foundation block for these engines used to air condition the Sears, Roebuck & Co. Building, Memphis, Tenn. An iron waste line passing through the block below grade is encased in cork. To isolate the exhaust steam line Vibracork was laid in pieces of channel used as bases for the hangers.
5. Noise from blowers in the Sun Life Assurance Company Building, Montreal, Canada, is hushed with Vibracork. The characteristic resilience of Vibracork is unique even among resilient materials. The thousands of minute air cells, which are part of the structure of cork, form a cushion which never loses its "life."
6. The motor generator set in the substation of the Louisville Gas & Electric Company, Louisville, Ky., rests on a cushioning layer of Vibracork which muffles vibration and reduces noise. Note also the cork housing on top and sides which absorbs air-borne sounds and aids in eliminating noise nuisance.
7. Shoppers are not annoyed by vibration from these elevator motor generator sets in the J. L. Hudson Store, Detroit, Mich. The machines are quieted by Vibracork. Since it does not take a "set" even under heavy loads, and does not disintegrate or deteriorate in service, Vibracork provides permanent protection against vibration.



WITH ARMSTRONG'S VIBRACORK



HOW TO LESSEN VIBRATION

PROPER LOADINGS FOR DIFFERENT DENSITIES

The greatest isolating effect will be secured by using as heavy loads and as light densities as is possible and practical. This is because the frequency of the cork varies inversely as the loads and directly as the densities.

Accordingly, the following loadings and densities will produce most effective results:

	Pounds per Square Foot
<i>XL Vibracork</i>	700 to 2000
<i>Standard Density Vibracork</i>	1500 to 4000
<i>Heavy Density Vibracork</i>	5700 to 8500

Sufficient Loading Vital

Approaching the highest limit will give the best results. To act as an efficient shock absorber, it is essential that any material used for this purpose be loaded sufficiently. Otherwise its elasticity will not come into action under the impact of a vibrating body, just as a spring will not function

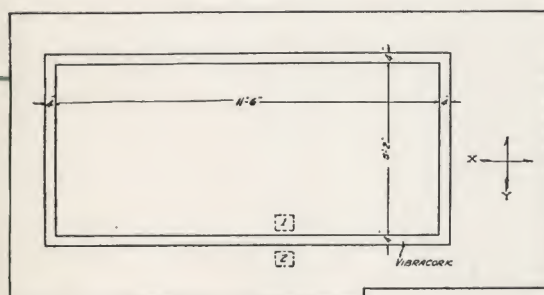


Fig. 1.

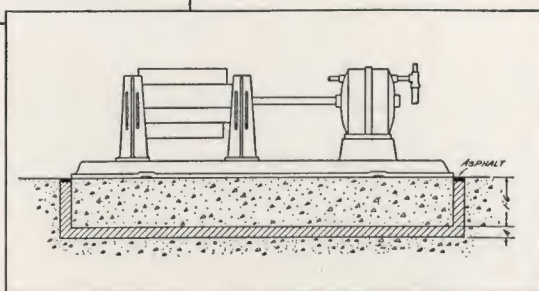


Fig. 2.

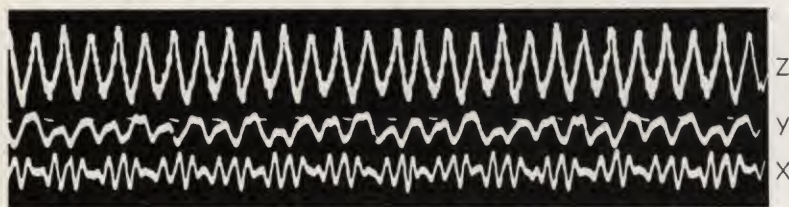


Fig. 3. Z shows the vertical vibration. Y shows the horizontal vibration at 90° to the shaft. X shows the horizontal vibration parallel to the shaft. The timing dots are 1/2000 of a minute apart.

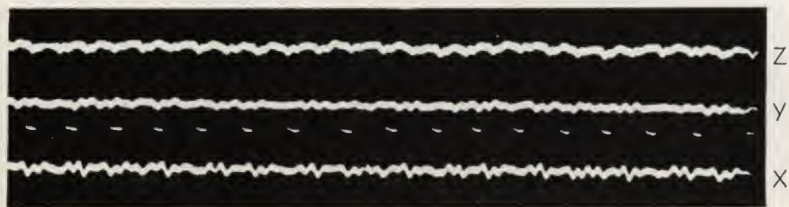


Fig. 4. Z shows the vertical vibration. Y shows the horizontal vibration at 90° to the shaft. X shows the horizontal vibration parallel to the shaft. The timing dots are 1/2000 of a minute apart.

VIBRATION RECORD OF WATER BRAKE DYNAMOMETER

Fig. 1. Plan of foundation showing Vibracork.

Fig. 2. Section of foundation showing Vibracork.

Fig. 3. Vibration picture taken at Point 1, Fig. 1, showing the vibration in the base of the dynamometer.

Fig. 4. Vibration picture taken on Point 2, Fig. 1, showing the great reduction in amplitude of the vibration.

WITH ARMSTRONG'S VIBRACORK

unless its elasticity bears a definite relation to the load imposed upon it. Heavy loading, therefore, is the ideal solution. From a practical standpoint some sacrifice of the benefits thus obtained are often necessary.

Other Factors Important

Where at all possible, the "floating" type of foundation should be used, even though it is at some sacrifice of heavier unit loading. Not only does the added weight of the heavy concrete foundation give additional load, but the center of gravity is lowered and its inertia is beneficial.

If it is not possible to use the "floating" type of machine mountings for the smaller types of machines, a mounting consisting of several cork pads with an indirect bolt connection to the machine foundation may be used.

Possibly the most important single precaution to observe is the elimination of through-bolts which tend to convey vibration and sound directly from the machine to the adjacent structure.

Since the isolating effect is improved with thickness, as great a thickness should be used as is compatible with good practice. Generally speaking, two- to four-inch thicknesses will give the best results.

VIBRATION RECORD OF VENTILATING FAN



Fig. 1. Plan of fan and motor.



Fig. 2. Section showing location of Vibracork and floor construction.



Fig. 3. Vibration record at Point 1, Fig. 1.



Fig. 4. Vibration record at Point 2, Fig. 1, showing absence of vibration in the floor slab.

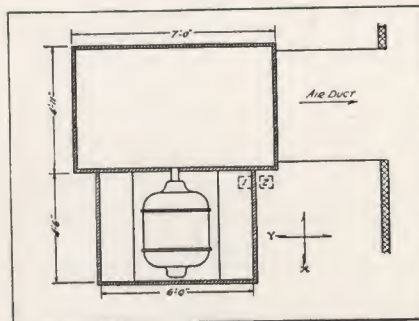


Fig. 1.

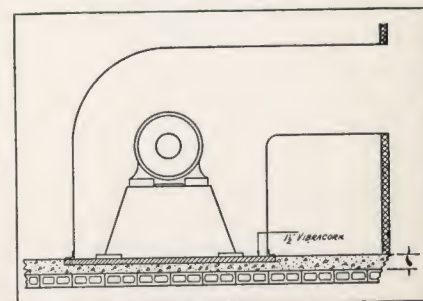


Fig. 2.

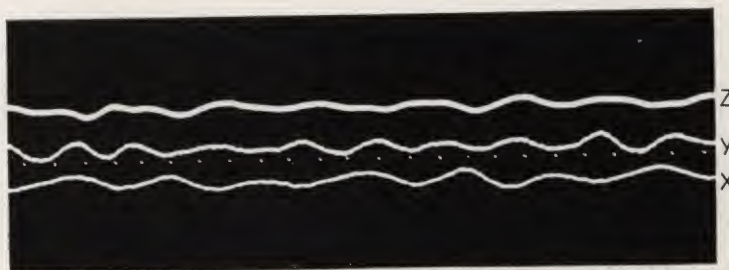


Fig. 3. Z shows vertical vibration. Y shows horizontal vibration at 90° to the shaft. X shows horizontal vibration parallel to the shaft. The timing dots are 1/2000 of a minute apart.



Fig. 4. Z shows vertical vibration. Y shows horizontal vibration at 90° to the shaft. X shows horizontal vibration parallel to the shaft.

HOW TO LESSEN VIBRATION

METHODS OF APPLICATION

Practically any type of machine may be isolated with Vibracork, although the method of application must, of course, vary to accommodate itself to the character of the setting.

There are two general methods of application, both subject to variation. In the first method, the foundation pit is finished with concrete, and then lined on both bottom and sides with Vibracork of the proper thickness and density, and set in hot asphalt. A suitable waterproof paper applied in hot asphalt is then put over the cork. Following that, the concrete for the foundation proper is poured in. The fact that the weight of the foundation increases the static load is often advantageous in securing compression on the isolation. This is an excellent construction and should be used wherever possible, especially with heavy machinery.

Second Application Method

In the second method, the Vibracork is applied directly between the machine's bedplate and the

floor or foundation to which it is fastened. Where the load of the machine is heavy enough in proportion to the area of the base, the isolation may be applied as a continuing layer. In most cases, however, the machinery isolation must be applied only over a limited area as in Figures 2 and 3 in order that sufficient protection may be obtained.

In cases where direct coupled machines are set up on independent foundation, they should be tied together with a continuous bedplate.

Where Vibracork is used between the machine and the foundation, and is not protected through being applied in channel-irons, it should be covered with light, telescopic metal pans. These pans will protect it from abrasion, oil, and chemicals, certain of which are likely to cause disintegration.

Expert Advice Available

The engineers of the Armstrong Cork Company will, without obligation, give you the full benefit of the wide experience of the company in isolating machines of practically all kinds. Address your inquiry either to your nearest branch office, as shown in the list elsewhere in this booklet, or to the Armstrong Cork Company, Building Materials Division, Lancaster, Pennsylvania.

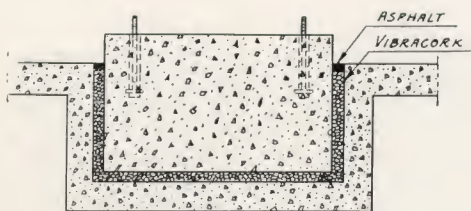


FIG. 1. TYPICAL DEPRESSED FOUNDATION
Isolation of single or multiple machine units may be accomplished most satisfactorily by the pit type foundation.

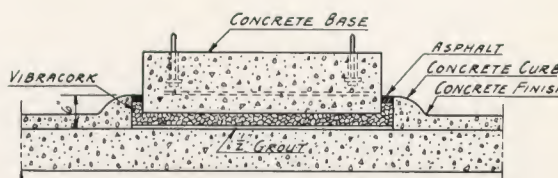


FIG. 2. FLOATING FOUNDATION
For Existing Suspended Slab
Light or heavy motor generator sets, pumps, and compressors may be successfully placed on the above type of foundation in connection with existing suspended concrete floors.

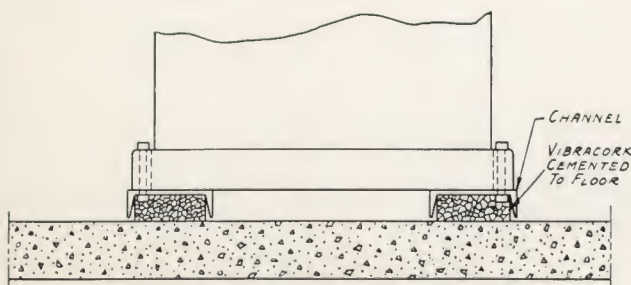


FIG. 3.
Method of isolating machines with strips of Armstrong's Vibracork set in channel irons and cemented to the floor.

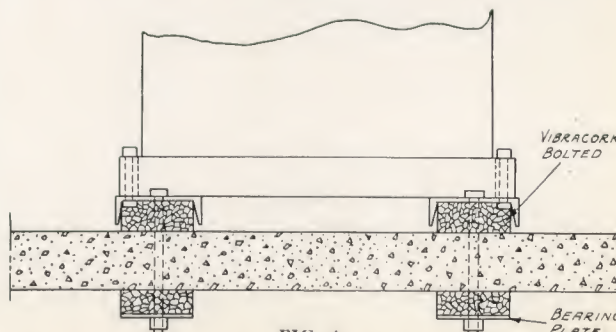


FIG. 4.
Another method employing channel irons but with the machine bolted through the floor and an extra pad of cork underneath.

WITH ARMSTRONG'S VIBRACORK

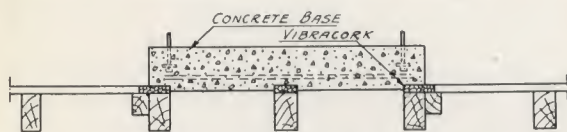


FIG. 5. FOUNDATION—MILL TYPE FLOOR CONSTRUCTION
A heavy concrete floating foundation will be satisfactory in some cases provided the wood floor is braced and proper concentration of load is taken into consideration.

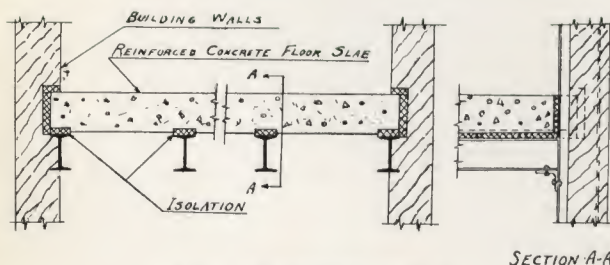


FIG. 6. SUSPENDED FLOOR
Entirely Isolated

Entire building floors may be completely isolated for either light or heavy manufacturing. The manner of installing the isolation for satisfactory results will depend upon the type of building construction.

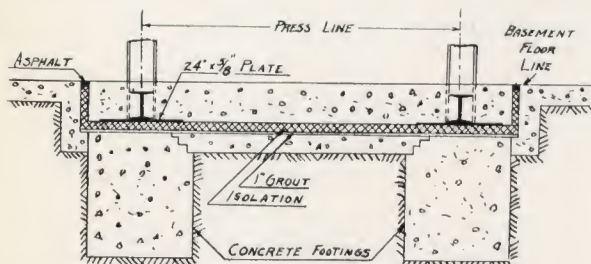


FIG. 7. TYPICAL PRESS FOUNDATION
Large Newspaper Plants

The above illustrates one of the approved methods of isolating printing presses in large newspaper plants. This may be varied to suit different types of building construction.

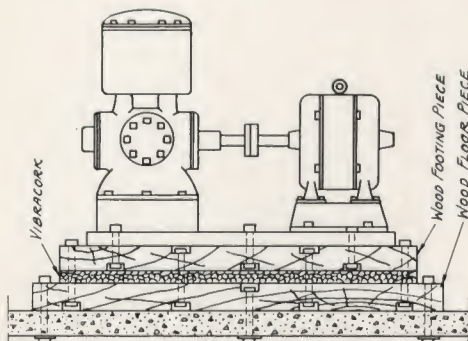


FIG. 8. PUMPS AND MOTORS ON SAME BEDPLATE

Two or more units on the same bedplate installed on existing wood or concrete floors. Particularly adapted for light motor generator sets, pumps, compressors, and other light weight machinery.

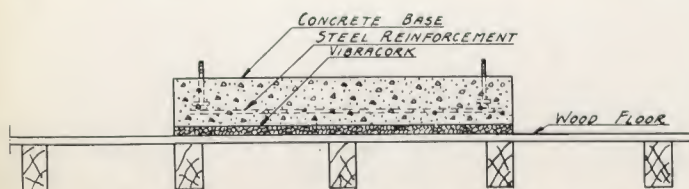


FIG. 9. FLOATING FOUNDATION—MILL TYPE FLOOR

In some cases, light or even medium weight machines may be isolated satisfactorily on a floating foundation resting on a mill type floor, provided the mass or weight of the base is sufficient.

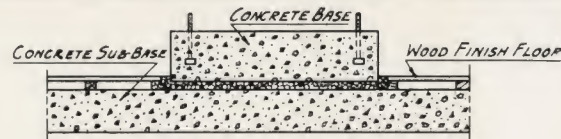


FIG. 10. FLOATING FOUNDATION
For Existing Suspended Slab

Floating foundations for single machines or groups of machines. Isolation should be placed in direct contact with concrete floor by cutting away wood floor finish on existing suspended slabs.

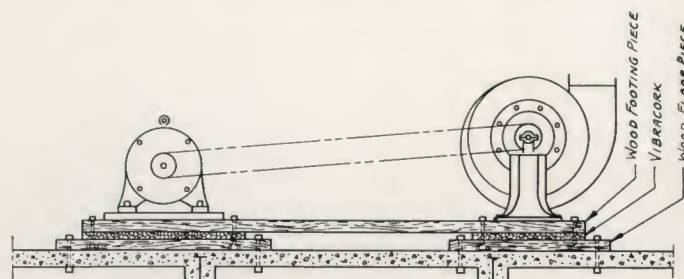


FIG. 11. ISOLATION OF LIGHT MACHINES

Two or more units on the same bedplate. This method is particularly adapted for light machines either on existing floors or new buildings.

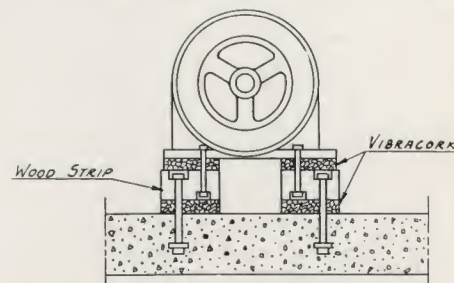


FIG. 12. SMALL MACHINE FOUNDATION

This type of isolation may be used in connection with very small machines which are installed on concrete or wood floors, or on platforms which are suspended from roof or ceiling.

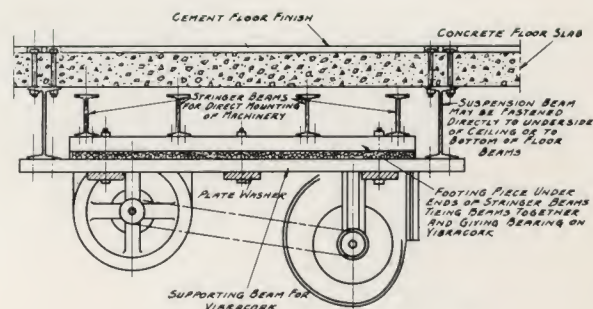


FIG. 13. SUSPENSION OF FANS AND MOTORS

For two or more units installed on the same bedplate using I beams and channel irons the above application provides a very effective method of complete isolation for suspension from ceilings.

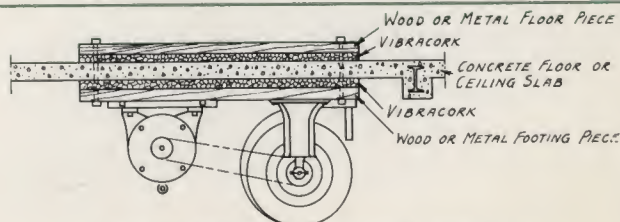


FIG. 14. ANOTHER SUSPENSION METHOD

Above is another suggested method by which fans, motors, and other ventilating equipment may be suspended from concrete slabs.

ARMSTRONG OFFICES

ALBANY 1-3 Thacher Street	DENVER 511-14 Interstate Trust Building	NEW ORLEANS 219 Tchoupitoulas Street
ATLANTA 424-26 West Peachtree St.	DES MOINES Liberty Bldg., 418 Sixth Avenue	NEW YORK 295 Fifth Avenue
BALTIMORE 119 South Street	DETROIT 1627 W. Fort Street	OMAHA 109 South Tenth Street
BOSTON 286 Congress Street	HOUSTON 903 Marine Bank Building	PHILADELPHIA 2313-17 W. Glenwood Ave.
BUFFALO 329-331 Ellicott Street	INDIANAPOLIS 930 Architects and Builders Bldg.	PITTSBURGH 24th Street and Allegheny River
CHARLOTTE 508 Johnston Building	JACKSONVILLE 1224 Barnett National Bank Building	RICHMOND 1615 W. Broad St.
CHICAGO 13th Floor, Merchandise Mart	KANSAS CITY 1535 Walnut Street	ROCHESTER 1 Mt. Hope Avenue
CINCINNATI 232 West Seventh Street	LOS ANGELES 1206 Maple Avenue	ST. LOUIS 1215 Washington Avenue
CLEVELAND 708-15 Caxton Building 812 Huron Road	LOUISVILLE 1420 Heyburn Building	SAN FRANCISCO 1355 Market Street
COLUMBUS 37 N. Third Street	MILWAUKEE 1300 Majestic Building	SEATTLE 803 Terminal Sales Building
DALLAS 1022 Santa Fe Building	MINNEAPOLIS 512 Plymouth Building	WASHINGTON, D. C. 1243 24th St., N. W.

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CLEVELAND, OHIO, 1893 East 55th St.	Clark Asbestos Company
DENVER, COLORADO, 1720 California St.	Stearns-Roger Manufacturing Company
EAU CLAIRE, WIS.	Horel-George Company
GREEN BAY, WIS., P. O. Box No. 1002	Northwestern Asbestos and Cork Insulation Co.
JAMESTOWN, N. Y.	Laco Roofing & Asbestos Company
JOPLIN, MO.	Joplin Cement Company
KINGSFORT, TENN.	Kingsport Lumber & Supply Co.
LITTLE ROCK, ARK., 1115 E. 2nd Street	Fischer Cement & Roofing Company
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MANITOWOC, WIS.	Northwestern Asbestos and Cork Insulation Co.
MEMPHIS, TENN., 266 Madison Ave.	Grant Brothers, Inc.
NEW ORLEANS, LA., 928-930 Tchoupitoulas St.	H. T. Steffee
OKLAHOMA CITY, OKLA.	Kelley Asbestos Products Company
PORTLAND, ORE., 221 S. W. Front Ave.	Asbestos Supply Company
PROVIDENCE, R. I.	Rhode Island Covering Company
SAN ANGELO, TEXAS	San Angelo Building Materials Co.
SAN FRANCISCO, CALIF., 557 Howard St.	Van Fleet-Freear Company
SEATTLE, WASH., 1st Ave. at Jackson St.	Asbestos Supply Company
SPOKANE, WASH., S. 8 Bernard St.	Asbestos Supply Company
SPRINGFIELD, MASS., 338 Columbus Ave.	Johnson Asbestos Company
SPRINGFIELD, MO.	Southwestern Insulation Company
TACOMA, WASH., 1720 Pacific Ave.	Asbestos Supply Company
TERRE HAUTE, IND.	The Hartmann Company
TULSA, OKLA.	Kelley Asbestos Products Company
WEST HAVEN, CONN.	Hugh J. Fitzsimons
WICHITA, KANS., 434 N. Rock Island St.	Ludeman Insulations Company



ARMSTRONG CORK COMPANY

Building Materials Division

Lancaster, Pa.

ARMSTRONG OFFICES

ALBANY
1-3 Thacher Street

ATLANTA
424-26 West Peachtree
St.

BALTIMORE
119 South Street

BOSTON

DENVER
511-14 Interstate Trust
Building

DES MOINES
Liberty Bldg., 418 Sixth
Avenue

DETROIT
1627 W. Fort Street

HOUSTON

NEW ORLEANS
219 Tchoupitoulas
Street

NEW YORK
295 Fifth Avenue

OMAHA
109 South Tenth Street

PHILADELPHIA
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